Can a Digital Awareness Campaign Change Knowledge and Beliefs Regarding Cochlear Implants? A Study in Older Adults in 5 European Countries

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Abstract
There are 466 million people living with a disabling hearing loss and the challenges of managing this public health crisis cannot be underestimated. Yet, adult utilization of cochlear implants is poor with less than 10% of suitable candidates receiving one. The aim of this study was to investigate the awareness levels regarding cochlear implants in older adults after a digital campaign to raise awareness of cochlear implantation in this population. To address the lack of awareness of the cochlear implants in the general population, adverts were placed in online medical magazines and mainstream newspapers. Data were collected in 400 subjects via an online market research questionnaire, in Germany, Austria, Sweden, and the United Kingdom, and compared with baseline data collected in a previous study. Median click rates were in line with expectations for the medical industry and approximately 22,000 individuals clicked through to the cochlear implant Web site. However, there were few significant differences between the 2 sets of data. The Internet was consulted as much as the doctor for medical information in Germany, Austria, and Sweden. The study reinforces the importance of the Internet in accessing information about health, including hearing loss. The click through rates shows that there is interest in learning about cochlear implants. Further work is needed to assess the impact of this type of campaign on individuals who have already been identified as hearing impaired.

Keywords
hearing loss, hearing aids, cochlear implants, awareness, elderly

Introduction
The World Health Organization estimated that there are currently an estimated 466 million people living with a disabling hearing loss globally and as the global population ages, this is expected to increase.¹ The challenges of managing this public health crisis cannot be underestimated. Untreated hearing loss brings with it huge economic and social costs as well as severely affecting the quality of life of sufferers. It is...
one of the major contributing factors to dementia in the adult population, and providing the correct hearing treatment might slow down the progress of this cognitive decline. Cochlear implants (CIs) are an effective treatment for severe to profound deafness in adults and children. In most developed economies, funding for a single implant in adults is provided either by national or local government or private health insurance. However, adult utilization of CIs is poor with less than 10% of those with severe to profound bilateral hearing loss receiving a CI. This is surprising given that cochlear implantation can provide a cost-effective solution with low surgical complication rates to alleviating the pressure of hearing loss on both individuals and global health systems. This low utilization is widespread, regardless of geographical location, and is independent of how health services are funded and economic output.

There is a lack of awareness of CIs in both professionals and potential recipients. In order to come forward to be assessed for a CI, individuals must feel that their hearing loss is severe and is affecting their quality of life. However, the benefits of the treatment must outweigh the risks and barriers to receiving it. Uninformed professionals can act as an additional barrier by providing inaccurate or inadequate information on the risks and benefits of cochlear implantation and improved education of audiologists, general practitioners (GP) and Ear Nose and Throat (ENT) specialists can greatly improve referral rates.

Very little data exist which directly measure public or professional awareness of CIs. In a study by D’Haese et al, data were collected from a sample of older adults (50-70 years old) via an online market research questionnaire based around the Health Belief model of health-related behavior. The questionnaire was designed to explore how susceptible people thought they were to hearing loss, how serious a threat it presented to their overall well-being, and what actions they might take to address the problem. It also sought to identify whether poor information relating to the treatments available acted as an additional barrier to seeking a hearing aid or CI.

The results showed that the doctor and the Internet were the main sources of information about hearing and other medical issues. The impact of hearing loss and its signs were well understood. People were aware that a hearing aid and a CI were different, but there was a misconception that hearing implants are permanently fitted and not externally visible. The authors indicate that a campaign to raise awareness of CIs and hearing loss would be beneficial.

If we are to change attitudes to CIs in the adult population, as informed clinicians we must act to improve awareness. However, to reach large numbers of the adult population, some form of mainstream media advertising is needed. This requires some commercial support, but it is also essential that we try to measure the impact of any interventions. This article reposts on the outcomes from such a campaign to raise awareness of cochlear implantation in the general population. Online media newspapers and journals were chosen as a cost effective medium in which to place the adverts and allowed readers to click on adverts to take them to a Web site providing further information. To measure the success of this approach, the same questionnaire and methods used in D’Haese et al were used to assess whether the awareness campaign had any impact on the areas explored in the previous study in a prospectively recruited matched sample of adults aged between 50 and 70 years. The results of the questionnaires collected prior to the awareness campaign, reported in D’Haese et al, were compared with the results obtained after the campaign.

**Methods**

A series of advertising banners were placed in a variety of online media sources in the United Kingdom, Sweden,
Germany, and Austria. The adverts were paid for by MED-EL GmbH. An example is given in Figure 1. If the banner was "clicked," the person was taken through to the country-specific MED-EL GmbH Web site where they could access the information about implantable devices that interested them. The media outlets chosen ranged from medical news forums such as netdoctor (www.netdoctor.co.uk) to mainstream newspaper titles such as The Times and Die Welt. Only online versions were targeted. The adverts ran from September 2013 for between 2 weeks and 3 months, depending on the media source. A second campaign was run in February 2014 for 1 to 2 months. The percentage of people who clicked on each banner was calculated after each advertising run, giving a click rate for each media source. It was not possible to monitor which pages were accessed on the MED-EL GmbH Web site once it was reached.

Three months after the campaign, a sample of 100 adult subjects were recruited by the Karmasin Motivforschung market research company. An e-mail was sent to individuals in the 50- to 70-year age bracket, in each participating country held on the Karmasin Motivforschung market research company data base with a link to complete an online questionnaire. Subjects had given their informed consent for their data to be used anonymously, had agreed to the Web site terms and conditions, and received no payment. No personal information was collected other than age bracket (50-70 years old), geographical region, and sex. All information was anonymized before being passed on to the authors for analysis. Individuals were matched to the original sample recruited for the baseline data collection. Subjects were recruited in 2 age brackets: 50 to 60 years and 61 to 70 years with equal numbers of men and women (Table 1). One hundred completed questionnaires with no missing data were collected for each country. There were no exclusion criteria other than having access to the Internet and being able to complete the questionnaire online.

The same questionnaire with 13 closed set questions as described in D’Haese et al7 was used to collect data which was compared with baseline data collected from June 1, 2013 to July 31, 2013, prior to any advertising and reported by D’Haese et al.7

No ethics approval was required for the study as it was designed to investigate the health issues within a population in order to improve population health and there was no intervention. It was conducted according to the principles laid out in the Declaration of Helsinki.

<table>
<thead>
<tr>
<th>Country</th>
<th>50-60 years</th>
<th>61-70 years</th>
<th>Male/female</th>
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<tr>
<td>Austria</td>
<td>61</td>
<td>39</td>
<td>50/50</td>
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<tr>
<td>Germany</td>
<td>53</td>
<td>47</td>
<td>50/50</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>40</td>
<td>60</td>
<td>50/50</td>
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<tr>
<td>Sweden</td>
<td>52</td>
<td>48</td>
<td>50/50</td>
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Fully anonymized click rates were collected from the media outlets chosen in accordance with the terms and conditions of each media source. No personal data were collected.

Statistics

The proportions of subjects selecting or not selecting each answer for the other questions were compared using a \( \chi^2 \) test with a significant result accepted as \( P \leq .05 \). BM SPSS Statistics 19 (IBM, Armonik, New York) were used for the analyses.

Results

A total of 10.5 million people looked at the page containing the advertising banner. It was then possible to see that 22,000 of them had clicked on the banner and were taken through to the CI company Web site. The click rates for each media outlet, across all countries, are shown in Figure 1 and give a measure of how successful the advertising banners were in getting people onto the MED-EL GmbH Web site. The 2 campaigns are shown in separate box plots and show that the median value was the same, but the second campaign, targeted at few providers, had a broader range of values. The Swedish medical journal site, www.Medicinskakcess.se, was an outlier in both sets of data with a click rate of 5.6%, as was audiology world news with a click rate across both campaigns of 3.5%. The next highest click rates were for netdoctor.de (0.75%) and netdoctor.co.uk (0.5%). As expected, the medical publications produced higher median click rates than the general publications, where median click rates were 0.16 and 0.18% for campaigns 1 and 2, respectively.

The results from the questionnaire given in 2014 were compared with the baseline data collected in 2013. Table 2 shows the areas where statistically significant differences in the results were found. The questions are taken from D’Haese et al7 and grouped according to their relevance to the Health Belief model.12 The number of people selecting each response was compared and any statistical differences identified.

In question 4, more respondents (10%) thought hearing loss could be cured in Germany than in the 2013 sample (\( \chi^2 = 5.1073, P = .02 \))

In question 6, the doctor and the Internet remained the top 2 sources of information about health and the number of people selecting these answers remained the same except for Germany where 13% fewer consulted the doctor, with more using the chemist and magazines and journals than before (\( \chi^2 = 4.1, P = .04 \)). Slightly more people (14% increase) selected Internet in Sweden this time (\( \chi^2 = 4.2, P = .04 \) (Figure 2). When asked in question 7 about access to information about hearing, the doctor and the Internet again remained the top 2 sources for all countries.

In question 10, the top sign of hearing loss, turning up the TV and radio, remained unchanged. Difficulties hearing high-pitched sounds, constant ringing or buzzing in the ears, problems and difficulties using a telephone, and an inability
to locate background sounds were the next 4 most popular answers in all countries, although the order varied slightly by country. In Germany, constant ringing was selected more frequently (14%) than before ($\chi^2 = 3.9, P = .047$).

In question 11, slightly more people in the United Kingdom (12% increase) would visit a hearing aid acoustician if they had hearing loss than in 2013 ($\chi^2 = 4.3, P = .037$).

In question 12, although restricted communication remained the top consequence of hearing loss in all countries, the number of people selecting this option went down by 13% in Sweden, to a similar level to impaired quality of life ($\chi^2 = 8.3026, P = .003$).

**Discussion**

More than 10.5 million people looked at the page containing the advertising banner and a total of 22 000 people clicked on the CI advert across the 2 campaigns. The campaign targeted a range of online publications, some of which were medical journals, which produced the highest levels of interest. The reported click rates for the general media of less than 2% are in line with expectations for the medical industry where a standard banner advertisement can expect a click through rate of 0.15%, with higher percentages for media rich adverts. However, despite the success in driving people to the CI manufacturers Web site, the questionnaire data showed little change in attitudes and behaviors from the sample taken a year earlier. Although the results show that this population used the Internet to access health information, they may not be reading the online newspapers and journals that were targeted and a different approach may be needed.

The statements related to hearing implants and hearing aids remained unchanged between time periods. The highest number of respondents selected “agree” to the statements that hearing implants are permanently fitted and that they are not externally visible. Some individuals may be attracted to a CI because they believe it represents an invisible hearing aid and are not encouraged to investigate the benefits further when they discover that it still requires the user to wear an external speech processor. The 2015 Eurotrak survey found that the main reasons given for not wearing a hearing aid were that the hearing loss was not severe enough and that
hearing aids were uncomfortable and embarrassing to wear.14 Thus, the miss conceptions about CIs in comparison with hearing aids, identified in the baseline data, remain.

Nonetheless, data collected in 2013, before the campaign, and in 2014, after the campaign, did show significant differences in some areas. Although the top 2 sources of information remained the doctor and the Internet, there was a significant reduction in visiting the doctor in Germany and a significant increase in using the Internet in Sweden. In Germany, Austria, and Sweden, the 2014 results showed a clear move toward using the Internet as much as the doctor to gain information. In the United Kingdom, visiting the doctor remains the primary source of information reflecting the dominance of the general practice model in this country. In Germany, more people felt that hearing loss could be cured.

When asked who respondents would go to and see whether they had a hearing loss, in Sweden, Austria, and Germany, ENT specialists retained their leading position as point of contact, followed by the hearing aid acousticians. In the United Kingdom, the pattern remains as before, with the GP as the first point of contact. However, significantly more people compared with 2013 selected the hearing aid acoustician as someone they would go and see whether they had a hearing loss and this is now the same as the number who would see an ENT specialist. This is possibly due to increased television advertising in the United Kingdom from a high street pharmacist offering hearing tests from qualified audiologists (audiologist is not an option on the questionnaire, as they are not present in every country).

In terms of the consequences of hearing loss, limited communication clearly remains on top of the list of possible consequences of hearing loss in all countries, followed by social isolation and an impaired life quality, in Germany, Sweden, and Austria. In the United Kingdom, frustration remains the second most selected consequence of hearing loss. It would be interesting to investigate this further to identify whether the frustration identified was due to the hearing loss or the availability of treatment. The results highlighted that increasing the volume of the television or radio is a main indicator of hearing loss for most people, and this should be included in any adult hearing screening questionnaire.

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Opinions about implants in the general population sample selected had clearly not changed over the course of the year. However, as the industry has become aware of the lack of correct information in the public domain, many other awareness activities as well as this campaign have been undertaken, and more recent surveys could show that attitudes are beginning to change.

Conclusions
It is essential that public awareness of hearing loss, its consequences, and the treatments available is improved. The study data reinforce the importance of the Internet in accessing information about health, including hearing loss, with it becoming a more important source of medical information than ever before. The encouraging click through rates show that there is interest in learning more about CIs and that this type of online-based general awareness campaign is 1 way of achieving this. However, a campaign which is more targeted toward hearing impaired individuals, to provide them with basic information about what a CI is and how it functions, may be a more successful approach.

Limitations
In this report, no attempt was made to separate the sample into medical and nonmedical subjects or sources of information, so the overall click rate may be skewed by the higher levels of interest from any professionals in the sample using the online medical journals. Hearing aid use was not considered as a factor, which might be expected to have a large effect on the outcomes and different numbers of subjects using hearing aids in the 2 samples may account for any differences in the results. The limitations of the questionnaire were that it was not validated, so its sensitivity to any changes was unknown. A closed set of answers was available, including other, but no box for open comment was provided. It was also not possible to control for other sources of information that were accessed during the study period. Therefore, it is impossible to say whether any changes were attributable to this campaign alone. A repeated measures design would have improved the sensitivity of the questionnaire and allowed us to assess whether being directed to MED-EL GmbH Web site changed individuals’ knowledge of a CI.

Author contributions
All authors contributed equally to the study.

Declaration of Conflicting Interests
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